1988

Don't Be Cowed by Scientific Evidence: A Pretrial Primer for Prosecutors and Defense Attorneys

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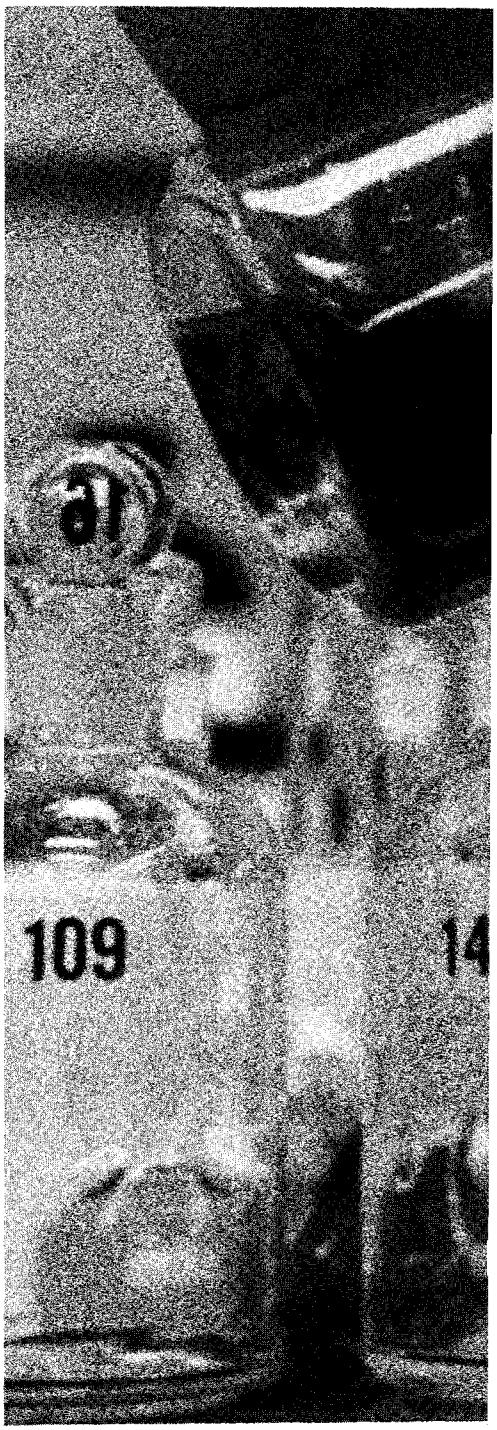

Eric Futran

Attorneys across the country are finding novel ways of using scientific evidence in criminal trials. In Seattle, prosecutors are gearing up to present evidence of a DNA "fingerprint" they claim will establish the source of semen recovered from a rape victim who, because of Alzheimer's disease, is unable to identify her assailant. The scientific premise is that deoxyribonucleic acid (DNA)—a basic component of human genetic structure which can be isolated from small samples of tissue, blood or semen—is, like the ridges, whorls and loops of one's fingertips, individually unique. *See generally,* 31 *J. Forensic Sci.* 393, 403, 409 (1986).

In a recent Florida case, a child abuse conviction of a mother was, in part, supported by the introduction of a "psychological autopsy" which associated her daughter's suicide with the mother's mistreatment. *Nat. L.J.*, Nov. 16, 1987, p.10; Jobes *et al.*, "The Impact of Psychological Autopsies on Medical Examiners' Determination of Manner of Death," 31 *J. Forensic Sci.* 177 (1986).

Psychological "syndrome" evidence is also being used by prosecutors with mixed success to establish lack of consent in rape cases (Rape Trauma Syndrome), or to prove sexual or physical abuse of young children (Child Sex Abuse Syndrome, Battered Child Syndrome). *See, e.g., State v. Black,* 42 Crim. L. Rptr. 2122 (Wash. 1987) (not admitted); McCord, "The Admissibility of Expert Testimony Regarding Rape Trauma Syndrome in Rape Prosecutions," 26 *B.C.L. Rev.* 1143 (1985); McCord, "Syndromes, Profiles and Other Mental Exotica: A New Approach to the Admissibility of Non-Traditional Psychological Evidence in Criminal Cases," 66 *Ore. L. Rev.* 19 (1987); Comment, 34 *U.C.L.A. L. Rev.* 175 (1986).

Defense counsel have joined the forensic psychology fray by offering evidence of Battered Wife Syndrome or Post Traumatic Stress Disorder in efforts to excuse or mitigate serious criminal offenses (see cases cited in McCord, *supra* at 1182-83) and submitting, through experts, an array of psychological studies which cast doubt upon the accuracy of the perceptions and memories of eyewitnesses. *See* e.g., Wells and Loftus, *Eyewitness Testimony* (Cambridge University Press, 1984); Cutler *et al.*, "The Reliability of Eyewitness Identification: The Role of System and Estimator Variables," 11 *Law and Hum. Behav.* 233 (1987).

These examples illustrate the kinds of scientific evidence that lawyers and judges may confront in criminal cases. It takes significant time and resources when developing, presenting and evaluating evidence of this sort. While these examples present relatively novel and controversial scientific theories and techniques, even the generally accepted types of courtroom evidence premised upon principles of physical and behavioral science—

fingerprints, hair and fiber comparisons, blood typing, firearms identification, forensic pathology, chemical substance identifications, mental health evaluations—are changing with the development of more sophisticated and discriminating testing techniques and instrumentation.

Despite these developments it is probably true that

> [l]awyers as a group evidence an appalling degree of scientific illiteracy, which ill equips them to educate and guide the bench in its decisions on admissibility of evidence proffered through expert witnesses. This scientific illiteracy is shared by a large segment of the trial and appellate bench; many judges simply do not understand evidence based on scientific principles; even more tragically, they overlook important attributes indicative of reliability of evidence they reject, while ascribing positive properties to other evidence they ac-

cept which that evidence simply does not possess.

Moenssens, Inbau and Starrs, *Scientific Evidence in Criminal Cases* 7 (3d ed. 1986).

Every prosecutor, defender, and judge, however, can become "literate" about the scientific issues that influence results in an ever growing number of criminal cases.

The basics

The legal issues developed through scientific evidence and expert testimony are basic. What was the cause (or instrument) of death or injury? How may the evidence be associated with the defendant? What is the nature of a substance (blood, soil, semen, fibers, hair), and how may the substance be associated with the defendant or a victim? Was a projectile fired by a particular or a certain type of firearm? In short, evidence we call "scientific" is a subcategory of circumstantial evidence from which inferences of relevant facts may be drawn.

There are several basic steps that counsel must take to investigate and prepare a case in which scientific evidence and expert witnesses will be tendered. In criminal cases the prosecution usually will be the proponent of evidence. The state has the burden of proof and has virtually exclusive access to state, local and FBI crime laboratory facilities. The defendant most often is in the unfavorable position of having to counter the force of impressive testimony by prosecution experts and, with rare exceptions, will lack the financial resources to retain expert witnesses. Moenssens, Inbau and Starrs, *supra* at 13-16.

The suggestions that follow are intended as guidelines for counsel preparing for a trial in which scientific and expert evidence is likely to be encountered. While the discussion will be cast from one adversarial perspective or another, most of the material will be relevant to both prosecution and defense.

Thorough pretrial investigation will alert counsel to issues upon which scientific evidence and expert testimony will be useful and even indispensable. Before a prosecutor enters the case, the investigating police agency will have collected evidence at the crime scene and elsewhere which, by the time the case is presented to the prosecutor, also may have been associated with a suspect or the victim. For example, the police will have collected blood, hair, fiber and other "trace" evidence from the victim and perhaps even the suspect. In homicide cases a medical examiner will have conducted an autopsy and filed a report describing the nature and extent of the victim's wounds, the cause of death, and the recovery of bullet fragments or other foreign material that may have been transferred during violent contact. The list of possibilities depends upon the type of crime and the nature of the investigation.

A prosecutor's early intervention is critical. Trace evidence may exist in minute quantities and will be handled by a number of different persons during the investigation and analytical stages of the case. Maintaining proper records of "chain of custody" is critical to admissibility at trial. Imwinkelried, *The Methods of Attacking Scientific Evidence* 79-104, 261-77 (1982).

The prosecutor must be aware of the limitations of local forensic laboratories' expertise and equipment, and must anticipate defense challenges in the nature of "Why was this or that test or procedure not performed to confirm your results and your opinion, etc." For example, it has been contended that "organic" cocaine derived from the coca plant (l-cocaine) is pharmacologically distinct from its "mirror image" or enantiomer (d-cocaine) which can be produced synthetically. If the relevant controlled substances ("Coca leaves and any salt, compound, or preparations of Coca leaves..."), opposing counsel may contend that the chemical tests performed upon the suspect substance, no matter how specific for other drugs, have not isolated the substance as l-cocaine. Kurzman and Fullerton, "Drug Identification," in Imwinkelried (ed.), *Scientific and Expert Evidence* 521, 548-53 (2d ed. 1981). These authors (citing other authorities) contend that the only way in which l-cocaine can be distinguished positively from d-cocaine is through the use of a "polarimeter (which shines plane polarized light through the sample and measures its optical rotation) or by nuclear magnetic resonance using a chiral lanthanide shift reagent." *Id.* at 550-51. The failure of the government's chemist to perform either of these confirmatory tests may create a reasonable doubt about substance identification.

Once the scientific issues are identified, get "up to speed" in the subject by reading the available literature. There are a number of publications that will provide the informational background requisite to the competent handling of scientific issues in criminal cases, and which will help the lawyer identify the kinds of witness expertise that will be required for the case. Without question this will require hours of hard work in seemingly alien territory.

There are some excellent basic texts written for lawyers which provide good starting points for research into the types of scientific evidence likely to be encountered in criminal trials. The most up-to-date of these texts are Moenssens, Inbau and Starrs, *Scientific Evidence in Criminal Cases* (3d ed. 1986), and Giannelli and Imwinkelried, *Scientific Evidence* (1986). For another entry into the field containing articles on basic subjects by a variety of authors, see Wecht (ed.), *Forensic Science* (a three-volume work recently published by Matthew Bender).

Another useful source is the collection of articles edited by Professor Edward Imwinkelried, *Scientific and Expert Evidence* (2d ed. 1981). Imwinkelried, one of the most prolific academic writers in the field,

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also has produced a helpful work called *The Methods of Attacking Scientific Evidence* (1982). As the title indicates, the book provides practical suggestions about how and when to raise questions of admissibility, and proposes arguments and tactics adapted to attacks upon the weight of the evidence. Despite its title, the book is of great utility to the proponents of scientific evidence as well—forewarned is forearmed. *See also* Imwinkelried, Giannelli, Gilligan and Lederer, *Courtroom Criminal Evidence*, ch. 6, pp. 113-88.

Departing from the legal literature, the single most useful source of "state-of-the-art" information is the *Journal of Forensic Sciences*, a publication of the American Academy of Forensic Sciences. This publication, which prints the scholarly work of academic and other forensic science specialists, is a gold mine for the trial lawyer, and provides a source of fascinating, and sometimes entertaining, reading. Thumbing at random through the 1986 collection, one finds the articles reporting the developments in recombinant DNA technology and its potential courtroom applications mentioned in the opening paragraph of this article, along with a case report of Homicidal Asphyxia by Pepper Aspiration (vol. 31, p. 1470), and a two part article by Professor James E. Starrs, "Once More into the Breech: The Firearms Evidence in the Sacco Vanzetti Case Revisited" (vol. 31, pp. 630, 1050). With regard to statistical, psychological and sociological issues, helpful articles can be found in the periodical *Law and Human Behavior*.

In addition, whenever scientific information is important to a case, counsel should make every effort to consult the original works on the relevant theories, experiments or testing procedures. It is not uncommon for mistaken interpretations or conclusions to be reported as "fact" in second- and third-hand accounts of the original work. Neither is it uncommon at trial to discover that an opponent's expert witness has relied upon secondary and tertiary sources in formulating his opinion. The opportunity to "zing" the witness with the original source should not be overlooked. *See, e.g.*, Treadway and McCloskey, "Cite Unseen: Distortions of the Allport and Postman Rumor Study in the Eyewitness Testimony Literature," 11 *Law and Hum. Behav.* 19 (1987). Reading the original source may also provide ideas to counter the theory, as will other articles or letters which take issue with the research.

Experts qualified to render opinions on one subject often are asked to hold forth on subjects about which they know very little. As "experts" they may be unwilling to admit that there is something related to their specialties that they do not know. Starrs, "In the Land of Agog: An Allegory for the Expert Witness," 30 *J. Forensic Sci.* 289 (1985). Properly prepared and scientifically "literate" trial counsel either will avoid this impropriety or be ready to take advantage of an opponent's attempt to smuggle a bogus expert opinion into the record.

Evidentiary standards

All preparation must be done in contemplation of the jurisdiction's standard for admission of scientific evidence. Jurisdictions throughout the country generally share the foundational criteria for the admission of expert opinion evidence as embodied in the Federal Rules of Evidence. The proponent first must establish logical relevance by showing its "tendency to make the existence of any fact that is of consequence to the determination of the action more probable or less probable than it would be without the evidence." FRE 401. Then, "[i]f scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue," a properly qualified expert may give testimony "in the form of an opinion or otherwise." FRE 702. The application of this rule is subject to the general limitations of FRE 403 which recognizes the trial court's discretion to exclude relevant evidence "if its probative value is substantially outweighed by the danger of unfair prejudice, confusion of the issues, or misleading the jury, or by considerations of undue delay. . . ." *See generally* Carlson, "Policing the Bases of Modern Expert Testimony," 39 *Vand. L. Rev.* 577 (1986).

While these criteria are viewed by many evidence scholars as adequate safeguards against the misuse of forensic evidence (*see, e.g.*, McCormick, "Scientific Evidence: Defining a New Approach to Admissibility," 67 *Iowa L. Rev.* 879 (1982)), many jurisdictions continue to require (albeit unevenly) the additional foundation requirements set down 64 years ago in *Frye v. United States*, 293 F. 1013, 1014 (D.C. Cir. 1923):

> Just when a scientific principle or discovery crosses the line between the experimental and demonstrable stages is difficult to define. Somewhere in this twilight zone the evidential force of the principle must be recognized, and while the courts will go a long way in admitting expert testimony deduced from a well-recognized scientific principle or discovery, the thing from which the deduction is made must be sufficiently established to have gained general acceptance in the particular field in which it belongs.

While commentators have argued that *Frye* is well past the age of retirement (*see generally* Symposium on Science and the Rules of Evidence, 99 F.R.D. 187-234 (1983)), and a number of federal circuits and states have rejected *Frye* (cases are listed in Giannelli and Imwinkelried, *Scientific Evidence* 14 n.56 (1986)), the "general acceptance" test remains strongly in force.

Whatever the doctrinal content of the test for admissibility, the chief concerns must be the reliability of evidence, the degree to which lay jurors can comprehend both the applications and the limitations of the evidence, and the availability to the accused of adequate means by which to counter an opponent's presentation. *See* remarks of Profes-

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sor Stephen A. Saltzburg in Symposium, *supra*, 99 F.R.D. 208-18.

The standards for admissibility contemplate the need for properly qualified expert witnesses to provide three basic types of information. First, unless the theory, principle or testing instrument has in past cases been established through judicial notice or acceptance, the proponent must present the testimony of a witness who is qualified to "teach" the judge and jury about the basic scientific premises that support the particular application at issue. Second, it must be shown that the tests were properly conducted and that the instrumentation or other materials used in making the test were in good working order or otherwise reliable. Third, the results of the tests must be interpreted competently and communicated to the trier of fact. Giannelli and Imwinkelried, *supra* at 1-47.

While it is possible that all three of these foundational requirements may be accomplished through a single witness, when relatively "novel" evidence is presented at least two witnesses will be required. The technician who conducted the test will be familiar with the mechanics of the procedure, but may not have the foggiest notion of the scientific theory upon which the procedure is based or of how the testing instrumentation is designed to provide the results. Likewise, the academic witness is unlikely to have conducted the tests personally.

A constitutional limitation upon overly restrictive applications of evidentiary standards that inhibit a defendant's right to present scientific evidence in her own defense may have been signaled in *Rock v. Arkansas*, 107 S. Ct. 2704 (1987). In *Rock* the state courts applied a *per se* rule excluding all hypnotically refreshed testimony and drastically restricted the defendant's trial testimony to the facts contained in her recorded pre-hypnosis statement. The Supreme Court held this application of the state rules of evidence to violate the accused's right to testify in her own behalf. The Court located this right in the Due Process Clause of the Fourteenth Amendment, the Compulsory Process Clause of the Sixth Amendment, and as a corollary to the Fifth Amendment's guarantee of a right to silence.

While the holding in *Rock* is quite narrow, and may be limited to restrictions upon a defendant's right to testify, the Court relied, in part, upon cases that recognize a defendant's right to present witnesses in his own behalf, *Washington v. Texas*, 388 U.S. 14 (1967); *Chambers v. Mississippi*, 410 U.S. 284 (1973), and upon the rationale that the state's general and legitimate concern with precluding untrustworthy evidence must be balanced against the right of the accused to present a defense. This same reasoning can be applied when *Frye* is used to ban whole categories of forensic evidence on the basis of an accused's inability to establish "general acceptance" within some arbitrarily defined scientific community. "A state's legitimate interest in barring unreliable evidence does not extend to *per se* exclusions that may be reliable in an individual case." 107 S. Ct. at 2714.

Discovery

Take maximum advantage of discovery procedures and pretrial motions to interdict the use of "bad" science and to prepare for cross-examination and the presentation of evidence at trial. Accurate identification and thorough evaluation of scientific issues are essential aspects of pretrial preparation. Most jurisdictions permit pretrial discovery by defendants of scientific reports and the results of tests conducted on behalf of the government. Defense counsel should be aware that requests for these materials may trigger a reciprocal obligation to provide information concerning defense conducted tests. The discovery options in all United States jurisdictions are summarized in Moenssens, Inbau and Starrs, *supra* at 23-53 (including a suggested motion form).

Although the final reports of the government's forensic specialists may identify the kinds of scientific issues that are likely to arise at trial, they are not particularly helpful in determining anything other than the conclusions reached by the forensic investigator and, perhaps, the kinds of testing procedures employed. Opposing counsel should seek disclosure of the lab books, work sheets and notes of the government's experts to evaluate the completeness and accuracy of the testing procedures. The defense should also request copies of the resumes of the state's experts, including educational and training background and a bibliography of papers, articles, manuals and books published by the expert witnesses that the state intends to present. Effort should also be made to obtain copies of (or access to) the laboratory or other technical manuals which set out the methodology, procedures, instrumentation, and controls that are to be used in testing. The failure of the government's witnesses to follow the recommended procedures would, of course, prove useful in cross-examination.

Some jurisdictions permit depositions of proposed expert witnesses and in most states the trial court will have discretion to order a deposition upon a proper showing of need. Moenssens, Inbau and Starrs, *supra* at 43.

Motions in limine

Having identified questionable forensic evidence through pretrial investigation and discovery, counsel may wish to challenge by motion in limine the admissibility of all or part of the proposed evidence. Imwinkelried, Giannelli, Gilligan and

Lederer, *Courtroom Criminal Evidence* 32-33 (1987). Not only will trial courts permit expanded hearings for the development of these issues when a jury is not waiting in the wings, a successful motion in limine will prevent the opponent from wafting prejudicial material into the jury box during trial. Another important function of this pretrial procedure is to identify precisely the probative limits of the scientific theories and the opinions of the experts and thereby keep the testimony within proper bounds at trial.

For example, microanalysis of the visible characteristics of hair samples can either exclude a suspect or lead to a conclusion that the suspect is within a class of persons that "could" have been the source of an unknown hair. Some estimation of the race of the source may also be made by a qualified examiner. *See generally* Moenssens, Inbau and Starrs, *supra* at 467-95. These conclusions are highly subjective and may be influenced by the examiner's knowledge that the "unknown" hair comes from a known suspect. Miller, "Procedural Bias in Forensic Science Examinations of Human Hair," 11 *Law and Hum. Behav.* 157 (1987). Some courts have permitted hair examiners to express a statistical conclusion that the probability of finding such a match from a person picked at random from a sample population is 1 in 4500. See, e.g., *United States ex. rel. DiGiacomo v. Franzen*, 680 F.2d 515 (7th Cir. 1982) (per curiam). This estimate is based upon a single study, Gaudette and Keeping, "An Attempt at Determining Probabilities in Human Scalp Hair Comparison," 19 *J. Forensic Sci.* 499 (1974), and is based upon a detailed hair characteristic examination that rarely, if ever, is replicated in a police forensic laboratory. Moreover, the usual lab technician witness will not be able to describe the research methodology employed by the original researchers, nor will he or she be able to explain the mathematical basis for the estimate. Further, the Gaudette study group of 100 subjects consisted of 92 whites, 2 blacks and 6 orientals. *Id.* at 605. Hence, the 1 in 4500 statistic has no application to non-white suspects. Finally, the Gaudette study has been criticized for methodological flaws (Barnett and Ogle, "Probabilities and Human Hair Comparison," 27 *J. Forensic Sci.* 272 (1982)), and is prone to misuse by prosecutors misstating the probative value of the statistical conclusion. Thompson and Schumann, "Interpretation of Statistical Evidence in Criminal Trials: The Prosecutor's Fallacy and the Defense Attorney's Fallacy," 11 *Law and Hum. Behav.* 167 (1987); Moenssens, Inbau and Starrs, *supra* at 487-95. In any case in which hair comparison evidence is expected, counsel should seek an order in limine precluding the use of the misleading statistical estimate derived from the Gaudette study.

Counsel should be aware that a motion in limine also can be employed to obtain a preliminary ruling on the *admissibility* of scientific evidence that is likely to come under attack at trial. Colbert, "The Motion in Limine in Politically Sensitive Cases: Silencing the Defendant at Trial," 39 *Stan. L. Rev.* 1271, 1282-83 (1987). Since hearsay limitations are not applicable to evidence submitted in support of a ruling on admissibility, the pretrial offer may be accompanied by tender of relevant affidavits, articles, and treatises as well as live testimony of qualified experts. *See*, e.g., FRE 104(a). For example, if the defense intends to present an expert witness to cast doubt upon the accuracy of eyewitness testimony, a pretrial ruling on the admissibility of that evidence will be of great value in mapping trial strategy.

Appointment of defense experts

Much of the advice offered here applies to those counsel with adequate time and resources for pretrial investigation and to hire expert witnesses. For those counsel involved in indigent defense, however, the picture is not completely bleak. The Supreme Court recently has recognized that a defendant's access to scientific expertise may be necessary to assure a fundamentally fair trial. *Ake v. Oklahoma*, 470 U.S. 68 (1985); see also *Caldwell v. Mississippi*, 472 U.S. 320, 323 n.1 (1985). In *Ake*, a capital case, the Court held that the Due Process Clause of the Fourteenth Amendment entitled an indigent defendant to access to psychiatric assistance in the preparation of his defense when it was shown that the issue of his sanity at the time of the offense would be a *significant factor* at his trial.

It is clear that *Ake* and *Caldwell* do not require a trial court to provide expert assistance to an indigent accused simply because scientific evidence may be relevant to a defense or will be presented by the prosecution. As interpreted in *Moore v. Kemp*, 809 F.2d 702 (11th Cir.) (*en banc*), *cert. denied*, 107 S. Ct. 192 (1987), *Ake* compels a defendant to demonstrate something more than a mere possibility of assistance from an expert. He must show "a reasonable probability both that an expert would be of assistance to the defense and that a denial of expert assistance would result in a fundamentally unfair trial." *Id.* at 712. The court did note:

> An expert can assist a criminal defendant in marshalling his defense in two essential ways. First, he can gather facts, inspect tangible evidence, or conduct tests or examinations that may aid defense counsel in confronting the prosecution's case, including its expert witnesses, or in fashioning a theory of defense. Second, the expert can provide opinion testimony to rebut prosecution evidence or to establish an affirmative defense, such as insanity.

In a given case the assistance of an expert could be so important to the defense that without it an innocent defendant could be convicted or, at the very least, the public's confidence in the fairness of his trial and its outcome could be undermined. *Id.* at 709-10.

Moore placed a significant burden on defense counsel to dem-

onstrate the need for such expert assistance and suggested that a failure of counsel to discharge that burden may be the basis for a claim of ineffectiveness:

> [D]efense counsel is obligated to inform himself about the specific scientific area in question and to provide the court with as much information as possible concerning the usefulness of the requested expert to the defense's case.

Id. at 712.

A lawyer who follows the steps outlined in this article should be able to make the kind of showing necessary to demonstrate the need for access to expert assistance. Even if a court is still inclined to withhold authorization for the retention or appointment of an expert independent of the prosecution, it may, in the interest of justice, at least be willing to authorize depositions of the state's experts. *See, e.g.*, Rule 15 of the Federal Rules of Criminal Procedure; FRE 706(a).

In addition to case specific arguments in support of *Ake* motions, trial courts should always be reminded of the dismal performance of crime laboratories reported as a result of the only systematic proficiency testing program that has been conducted in this country. Peterson *et al.*, "Laboratory Testing Research Program, Final Report of LEAA Grants 74NI-99-0048 and 76NI-99-0091," Forensic Sciences Foundation, June 1977 (described in Moenssens, Inbau and Starrs, *supra* at 5-6 n.10).

Scientists and technicians, like lawyers and judges, are eminently fallible. **CJ**